

Northwest Africa 4884

Anorthosite-bearing basaltic regolith breccia

42 g



Figure 1: Interior surface of NWA 4884 with fingers for scale.

Introduction

Northwest Africa 4884 was found in 2007 in northwest Africa. It is comprised of a single stone (42 g) partially covered by black fusion crust; interior slices show it to be a breccia composed of white, beige and light gray clasts in a dark gray matrix (Fig. 1).

Petrography and Mineralogy

Preliminary reports (Connolly et al., 2008) describe it as a "regolithic breccia composed of abundant angular mineral and lithic clasts in a sparse vesicular, glassy matrix. Mineral fragments include calcic plagioclase ($An_{92.4-95.3}Or_{0.5-0.1}$), pigeonite ($Fs_{52.3}Wo_{10.5}$; $FeO/MnO = 65.2$), augite, Ti-chromite, ilmenite (one with a tiny

baddeleyite inclusion) and silica polymorph. Lithic clasts include several types of mare basalt (a coarse-grained example is composed of olivine + zoned pigeonite + calcic plagioclase + ilmenite + troilite), granophyric intergrowths of Fe-rich augite+fayalitic olivine+silica polymorph, a coarse grained dunitic or troctolitic rock containing a large metal grain (associated with rutile and secondary ilmenite), and a large "breccia-within-breccia" clast. Mare basalt clasts and debris are predominant over highlands lithologies." Olivine clasts ($Fa_{37.0-37.7}$; $FeO/MnO = 94-98$) are very different from olivine in a basalt clast ($Fa_{87.9}$; $FeO/MnO = 89$), and augite lamella ($Fs_{31.9}Wo_{31.9}$; $FeO/MnO = 60.3$), pigeonite clast ($Fs_{60.1}Wo_{7.0}$, $FeO/MnO = 71.1$), and augite clasts ($Fs_{17.2}Wo_{36.9}$,

FeO/MnO = 53.3) are slightly different in composition from those in the basaltic clasts.

Table 1. Chemical composition of NWA 4884

reference 1
weight 181
technique INAA

SiO₂ %
TiO₂
Al₂O₃
Cr₂O₃
FeO 13.7
MnO
MgO
CaO
Na₂O 0.365
K₂O
P₂O₅
S %
sum

Sc ppm 30.1
V
Cr 2090
Co
Ni 161
Cu
Zn
Ga
Ge
As
Se
Rb
Sr
Y
Zr
Nb
Mo

Chemistry

The intermediate FeO content and high Sm are consistent with this sample being a mixture of anorthositic and basaltic materials in a regolith breccia (Table 1).

Ru
Rh
Pd ppb
Ag ppb
Cd ppb
In ppb
Sn ppb
Sb ppb
Te ppb
Cs ppm
Ba
La
Ce
Pr
Nd
Sm 3.06
Eu 0.786
Gd
Tb
Dy
Ho
Er
Tm
Yb
Lu
Hf
Ta
W ppb
Re ppb
Os ppb
Ir ppb 3.4
Pt ppb
Au ppb
Th ppm 0.93
U ppm

References: 1) Korotev et al. (2008).

Radiogenic age dating

Cosmogenic isotopes and exposure ages

None yet reported.